PRELIMINARY

INSTRUCTION MANUAL

SD-101 DYNAMIC ANALYZER

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

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OFFICIAL RECORDS STATION
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APPENDIX

Block Diagram - SD-101 Dynamic Analyzer
Schematic - SD-101 Dynamic Analyzer

SECTION I - GENERAL

1.1 UNPACKING

The Model SD-101 Dynamic Analyzer is shipped fully assembled in a polystyrene carton which protects the instrument against all normal shipping hazards. To determine possible damage during shipment of the instrument, the procedures given below should be followed:

(a) Place the carton upright on the floor and inspect the exterior, making note of any visible damage.

(b) Remove and retain all forms and invoices attached to the carton by the carrier.

(c) Unseal the top portion of the carton and remove.

(d) Lift the instrument out of the carton and place it on a work bench or other flat surface.

(e) Inspect the exterior of the Dynamic Analyzer carefully, noting all visible damage.

(f) The Dynamic Analyzer may now be checked for functional operation by following the procedure outlined in Section II.

1.2 CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to us. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. Include Model Number and Serial Number when referring to this instrument for any reason.

SECTION II - OPERATION

2.1 SPECIFICATIONS

Frequency Range	2 - 25,000 cps
Useful Range	1 - 30,000 cps
Dynamic Range	Meter Ckt 55 db Filtered Signal Output 50 db Linear DC Output 30 db
Linearity	Meter Ckt ±3% of F.S. DC Output ±3% of F.S. Filtered Signal Output ± 0.5 db
Sensitivity	1 mv - 1000 v full scale
Input Impedance	1 megohm
Tuning Signal	0.5 v (rms) minimum input required (sinusoidal) with less than 5% distortion
Selectivity	Accommodations are provided for two plug-in crystal filters. Typical bandwidths are 2.0, 5, 10, 20 and 50 cps. The shape factor (60 db/ ± 3 db bandwidth) of each filter is nominally 4/1.
Calibration	Internal Reference
Tracking Rate	The unit may be swept at rates in excess of 500 cps/sec when used as a tracking filter. A PSD analysis using a 20 cps filter from 10 cps to 3 kc, may be accomplished in one minute
Outputs	1. Recorder: 0 - 1 vdc into 10K 2. Filtered signal: Adjustable for 10 v rms maximum into 100 K load
Power	105 - 125 vac, 50/60/400 cps. 120 watts approximately. 230 vac by special order
Input/Output Availability	All input and output jacks on the front panel are paralleled with connectors on rear of unit
Size	7" high, 19" wide, 14" deep Shipping weight: 37 lbs

2.2 PRELIMINARY OPERATION CHECKS

A. Meter Mechanical Zero

Check the meter mechanical zero. If the pointer does not rest directly over the zero with the power off, proceed as follows: A stable adjustment can only be made when the direction of pointer travel is opposite to the direction of rotation of the adjust screw. The adjusting screw may be turned in either direction, but a good way is to turn the screw clockwise until the pointer swings up-scale and then starts to swing down-scale towards zero. Continue turning the screw clockwise until the pointer (now moving to the left) is directly over the zero mark. If you go too far, continue turning the screw clockwise until the pointer is again traveling down-scale toward zero. Tap the meter lightly to avoid any friction in the movement from giving a false indication of zero.

B. Carrier Switch

Check to see that the carrier "INT/EXT" toggle switch located on the rear of the unit is in the "INT" position.

C. Installation of Filters

Loosen the Camloc fasteners, holding the top cover in place by turning the fasteners one-half turn counterclockwise. Rotate cover back (cover is rear-hinged), exposing the interior of the equipment. Plug in the crystal filters in the octal sockets marked "F1" and "F2" located on top of the chassis. "F1" and "F2" correspond to the front panel filter selector, Positions "1" and "2", respectively. Narrow or broad filters can be installed in any desired order.

D. Insertion Loss Correction Potentiometers

The filter insertion loss correction potentiometers are multi-turn trimpots located behind the front panel on the filter selector switch. The left-hand potentiometer adjusts the output of filter "F1" - the right-hand potentiometer adjusts "F2". The insertion loss is higher in the narrower bandwidth filters; therefore, the following is the setup procedure used to normalize the filter insertion loss:

1. Apply power to unit and turn power switch to "STANDBY". Allow approximately 15 minutes for warm-up before proceeding.

2.2 PRELIMINARY OPERATION CHECKS - Continued

2. Turn "RANGE" and "MULTIPLIER" selectors to "CAL" position. Turn power switch to "ON".

3. Select filter position which selects narrowest filter installed.

4. Adjust the "FREQUENCY" control for a peak indication on the output meter.

5. Turn the insertion loss potentiometer for a meter reading of "7". If potentiometer fails to provide sufficient adjustment to obtain a meter reading of "7", obtain the maximum reading and adjust the "GAIN" control to obtain the reading of "7".

6. Select the broader filter and turn the corresponding insertion loss potentiometer to obtain a meter reading of approximately "7" on the meter.

7. Repeat Step #4 and re-adjust insertion loss potentiometer for an exact reading of "7" on the meter.

8. Recheck narrow and broad filters being careful to re-peak the frequency control each time a different filter is selected.

NOTE: Before operating the SD-101, study the Block Diagram, Schematic & Application Brochure.

2.3 OPERATION

A. Filter Center Frequency Alignments and Sensitivity Cal

On calibrate, the units sensitivity is compared against the voltage output of an internal zener diode reference operating at the line frequency. The filter center frequency alignment relative to the tuning frequency, as well as the sensitivity calibration, is performed as follows:

1. Turn on power and allow unit to warm up.

2. Turn "RANGE" and "MULTIPLIER' selectors to "CAL" position. This operation connects the internal reference to the input of the Analyzer, and provides an internal tuning signal to the unit.

2.3 OPERATION - Continued

3. Select desired filter

4. Adjust the frequency control for a peak indication on the output meter.

5. Adjust the "GAIN" control for an indication of "7" on the output meter.

   REMEMBER: Repeat above procedure when selecting a different filter bandwidth. Some filters will have their center frequencies close enough to omit re-peaking the meter each time a different bandwidth filter is selected. Nevertheless, the above is a good habit to develop.

6. Apply the tuning frequency and data signal to their proper front or rear connectors. Adjust the tuning signal level control for centerline on the tuning meter.

THE INSTRUMENT IS NOW READY & OPERATING

2.4 SETTING THE "RANGE" AND "MULTIPLIER" SWITCHES

Always start any measurements with the "MULTIPLIER" switch in the "1.0" position. Rotate the "RANGE" switch to obtain an up-scale reading. The purpose of this is to utilize the full dynamic range of the instrument. The filtered signal output is only affected by the "RANGE" control, and this means the signal-to-noise ratios are primarily dependent on the "RANGE" setting.

CAUTION

This input level should not exceed the range control volts rms. Higher values can overload the input amplifier.

The unit will withstand crest factors (peak/rms) of approximately 2.5 to 1 when operating with the maximum rms input. This ratio goes up proportionally as the input level is less than the range (rms).

2.4 SETTING THE "RANGE" AND "MULTIPLIER" SWITCHES - Continued

EXAMPLE: Range switch set at 1V rms - input level .5V rms

The input amplifier will now handle crest factors of 5 to 1. This becomes a factor when dealing with random or sine random type of input signals. However, clipping the large transient peaks of a random signal will not appreciably affect the accuracy of measurement.

2.5 MAKING RELATIVE MEASUREMENTS

When observing relative levels on the meter, the front panel "GAIN" control can be used to adjust the reading over an 11 db range. Adjust for a full scale reading with the "MULTIPLIER" on the "1.0" position. Re-establishing the instrument calibration on an absolute basis can be accomplished by repeating the procedure of Paragraph 2.3.

2.6 CALIBRATION OF INTERNAL REFERENCE

To re-calibrate the instruments internal reference against a standard voltmeter, the following procedure is used:

1. Set the "RANGE" at 1v and the "MULTIPLIER" at "1.0" and select narrowest filter in unit.

2. Connect an external signal of 1V rms from an oscillator to both the "SIGNAL INPUT" and "TUNING INPUT". Adjust the Tuning Signal Meter for a centerline indication.

3. Adjust the "FREQUENCY" control for a peak indication on the output meter.

4. Adjust the "GAIN" control for a full scale meter indication.

5. Switch the "RANGE" and "MULTIPLIER" to "CAL" and the meter should indicate "7". If not, open the top cover of the instrument and adjust the potentiometer marked "R7 CAL ADJ" located on the top left side of the chassis until a meter reading of "7" is obtained. Repeat the procedure to be sure of proper adjustment, and lock "CAL ADJ" potentiometer, observing the meter reading with the "RANGE" and "MULTIPLIER" switches in "CAL" to make sure this reading does not change when re-locking potentiometer.

2.7 TYPICAL OPERATIONAL TROUBLES ENCOUNTERED

SYMPTOM	PROBABLE CAUSE AND REMEDY
1. No Power	Blown fuse - Replace with 2 amp, 3 AG slo-blow. If this fails, remove bottom cover & check for possible short circuit in B+ lead. B+ leads are all the red leads, with exception of leads from the transformers.
2. Distortion of Filtered Signal Output	a) Too high or too low level of tuning signal. Re-adjust the center line on tuning amplitude meter. b) Distortion or noise in the tuning signal. Remedy: Source of noise or distortion being fed to Tuning Signal Input. c) Filter bandwidth too wide for frequency of operation. d) Input signal level to Analyzer too high, overloading input amplifier. Reduce level at input. e) Range switch in wrong position.
3. Excessive noise in Filtered Signal Output	Input level too low, thus not using full dynamic range of filtered signal output. Range switch in wrong position.
4. Frequency response poor at low frequency	Load impedance on filtered output too low. Increase to 100 K or more.
5. Irregular meter fluxuation at low frequencies	Filter bandwidth too wide for frequency of operation. Use narrower filter.
6. No Tuning Meter indication	Carrier "INT-EXT" switch in wrong position. Tuning amplitude potentiometer in wrong position.

If any additional operating difficulties are encountered, contact the nearest Spectral Dynamics' representative, or the factory.

REVISIONS		
CHG	DESCRIPTION	DATE

SIGNAL INPUT (FRONT)

SIGNAL INPUT (REAR)

SIA RANGE

GAIN ADJ

0.1 1.0 10 W1 100 1000 CAL

INPUT AMP

CATHODE FOLLOWER

BALANCE MOD

CATHODE FOLLOWER

S2 FILTER SELECTOR

FILTER FL1

FILTER FL1

100KC TUNED AMP

S3 MULTIPLIER

.01 .03 0.1 0.3 1.0 CAL

METER AMP

METER M1

FILTER

RECORDER ADJ

RECORDER OUTPUT (FRONT)

RECORDER OUTPUT (REAR)

CAL ADJ

CAL CKT

DEMOD

27 KC LOW PASS FILTER

OUTPUT AMP

TUNING SIGNAL INPUT (FRONT)

TUNING SIGNAL ADJ

SIA

W2

CAL

TUNING SIGNAL INPUT (REAR)

INPUT AMP

FILTERED SIGNAL OUTPUT (FRONT)

FILTERED SIGNAL ADJ

FILTERED SIGNAL OUTPUT (REAR)

STBY LAMP

ON LAMP

OFF STBY ON

6.3 VAC

OFF STBY ON

B+ TO REMAINING CKTS

AC / DC POWER SUPPLY

OFF STBY ON

S6 POWER

115 VAC 50/60/400cps

B+ TO CARRIER CONVERTER

INT EXT

INT EXT

CATHODE FOLLOWER

INTERNAL CAR. OUTPUT (REAR)

S4 CARRIER SELECTOR

METER M2

EXTERIOR CAR. INPUT (REAR)

UPPER PRINTED CKT BOARD

LOWER PRINTED CKT BOARD

CATHODE FOLLOWER

CATHODE FOLLOWER

MOD

MOD

AMPLITUDE BALANCE

CATHODE FOLLOWER

CATHODE FOLLOWER

100 KC CRYSTAL IN OVEN

AMP

FREQ ADJ

PHASE ADJ

CARRIER CONVERTER

4. SYMBOL INDICATES REAR CHASSIS CONTROL.
3. SYMBOL INDICATES FRONT PANEL CONTROL.
2. SYMBOL INDICATES INTERNAL SCREW DRIVER ADJUSTMENT.
1. SYMBOL INDICATES FRONT PANEL SCREW DRIVER ADJUSTMENT.

NOTES—

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BLOCK DIAGRAM— DYNAMIC ANALYZER, MODEL SD101

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

DRAWN	APPROVED	SHEET	OF	CODE IDENT	REV.
G. MILLER		1	1	10009	C

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REVISIONS		
	DESCRIPTION	
A	INITIAL RELEASE	5-67
B	PACKAGING & MFG. ENGINEERING	6-67
C	CAPACITOR ORDERING INFO. ADDED	8-67
D	ECO-SD-0134 & 0135, 10-67	
	SEE SHEET 2	
C1	C1 WAS .5 μF, 15 WAS 0.5 AMP	10-67
	ADDED NOTE 7 AND RELOCATED C63, C64, C3, C4, R243, R245, REVISED R7	10-67
D	ADDED SHEET 2	10-67
E	ADDED 100 OHM 2W RESISTOR IN SERIES WITH 6.3VAC TO FILS	5-68
F	UNITS 70 & UP	5-68
G	REMOVED C13, C14, C15 & C16 FROM CIRCUIT, ADDED C13 & C14 TO SHEET 2	5-68
H	ECO-SD-0134 EFFECTIVE ON UNITS 70 & UP	5-68
J	ECO-SD-0135 EFFECTIVE ON UNIT 74 & UP	5-68
K	R1, R2, R3, R4, R5 & R6 CHANGED TO 1% TOLERANCE, ADDED C79	6-68
L	ECO-SD-0136 EFFECTIVE ON UNITS 81 & UP	6-68
M	ADDED C80 TO OUTPUT OF MULTIPLIER	6-68
N	CHANGED R1 & R2 TO 1% TOLERANCE	6-68
P	SERIES 100 P.S. BOARD SHOWN DELETED	10-68
R	ECO-SD-0138 CHANGED VARIOUS RESISTORS TO 1% TOLERANCE EFFECTIVE ON ALL UNITS	10-68

SIGNAL INPUT (FRONT PANEL)
SIGNAL INPUT (REAR)
J1
J2
C1 (.1UF/1500 SURGE)
SIA RANGE
SIB RANGE
CAL
6.3VAC
CARRIER INT.
EXT.
OVEN
CRYSTAL
MATCHED DIODE PAIR
FILTER SELECTOR
MULTIPLIER
RECORDER OUTPUT (REAR)
RECORDER OUTPUT (FRONT PANEL)
J20 (INPUT)
115VAC 50/60/400CPS
2 AMP SLO-BLO
FILTERED SIGNAL OUTPUT (FRONT PANEL)
CARRIER OUTPUT
FILTERED SIGNAL OUTPUT (REAR)
EXTERNAL CARRIER INPUT
TUNING SIGNAL INPUT (REAR)
TUNING SIGNAL INPUT (FRONT PANEL)
CIRCUIT GND
(UPPER)
(LOWER)
TO 143 PINS 2&8
6.3VAC TO FILS
B+ = 150 VDC
TYPICAL FILTER (FL1 & FL2)
7895 (TYP.)

LAST NO. USED	
	CR14
	F1
	FL2
	J2
	J20
	L10
	M2
	RC46
	SC
	T5
	V48

⚠ FACTORY ADJUSTMENT.
⚠ ½ WATT ± 0.5% RESISTORS.
6. ALL TUBES - 7895 NUVISTORS UNLESS OTHERWISE SPECIFIED.
⚠ ¼WATT ± 1.0% RESISTORS.
4. ALL CAPACITORS IN MICROFARADS & ARE 200V UNLESS OTHERWISE SPECIFIED.
5. ALL RESISTORS IN OHMS & ARE ½W ±5% UNLESS OTHERWISE SPECIFIED.
7. BLOCK DIAGRAM-1000B.
8. CHASSIS ASSY-1002I.

SCHEMATIC DIAGRAM - DYNAMIC ANALYZER, SD101

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